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STRUCTURE OF PODOPHYLLUM.

By Edson S. Bastin.

The rhizomes of podophyllum grow horizontally or nearly so, but two or three inches beneath the surface of the ground, and in favorable soil, such as that of rich woods, may attain a length of a yard or more. Except for the swollen nodes that occur along them at intervals of from two to five inches, they are nearly cylindrical, and when well developed have the thickness of an ordinary lead pencil. The large nodes, however, may be twice as thick. From these, lateral branches are occasionally sent out, which resemble the parent rhizome, and also from their vicinity (mainly from the sides and lower surface) spring most of the roots with which the rhizomes are provided.

The rhizome increases in length by means of an axillary bud near its apex, and after it has attained a length of two or three feet, it decays at the base. By reason of this, each plant year by year is slowly travelling through the soil, and because the rhizome also branches, the one plant in the course of a few years becomes a colony of plants.

It is chiefly for this reason that we find the plants growing close together in patches, sometimes covering many square rods so densely with their foliage as to completely hide the ground.

Between the swollen nodes we have mentioned, occur the angular scars of bud-scales that have decayed as the rhizome developed, and about the large, circular scars found on the upper sides of the swol-

len nodes, we find a series of compactly arranged annular scars, which are also the scars of bud-scales.

The large circular scars just referred to, are of two kinds, one cup-shaped, and the other similar, except a central conical elevation, which is in reality a small bud. The former are the scars left by the decay of above-ground stems, the latter, scars of the large, radical leaves, of the previous seasons.

If the rhizomes have been collected in late autumn or in early spring, there will be found ascending from their apices and from those of their main branches, conspicuous terminal buds. A longitudinal section through some of these buds will show on the interior a stem with a pair of opposite leaves and a flower bud already

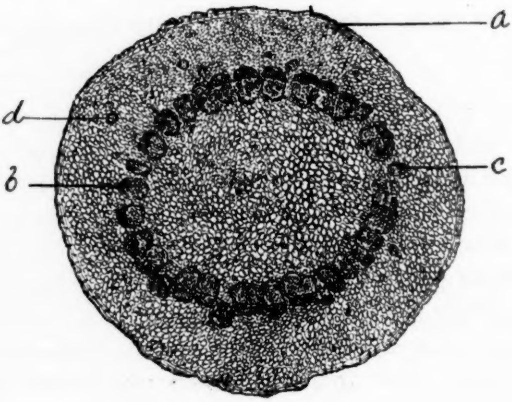

FIG. 1.

formed. Others, which have the same appearance exteriorly, contain only a radical leaf, but having its parts already well-developed and its peltate blade plicately folded down over the cylindrical petiole. A section will show at the base of this petiole a minute bud, over which in fact the petiole fits like a candle-extinguisher. When in the latter part of summer the leaf falls away, this bud appears as the conical elevation already alluded to, in the centre of the scar.

Besides this bud, the section will show another minute one on the lower surface of the rhizome in the axil of one of the bud-scales. This serves to continue the growth of the rhizome under ground while the leaves and stems are growing above ground.

Other small buds may also be found in the axils of some of the lateral scales, destined to give rise to rhizome branches.

The roots have a diameter when fresh of about one-sixteenth of an inch at their base, are four or five inches long, and branch rather sparingly near their origin, quite freely toward their apex.

A cross-section of the rhizome made at some point between the swollen nodes shows a large pith, a circle of wood bundles, the members of which are but little longer in the radial than in the tangential direction even in old rhizomes, a rather thick cortex consisting mostly of parenchyma, but with occasional small vasal bundles and a thin layer of not very well-developed collenchyma beneath the epidermis or the cork that has taken its place. The vasal bundles in

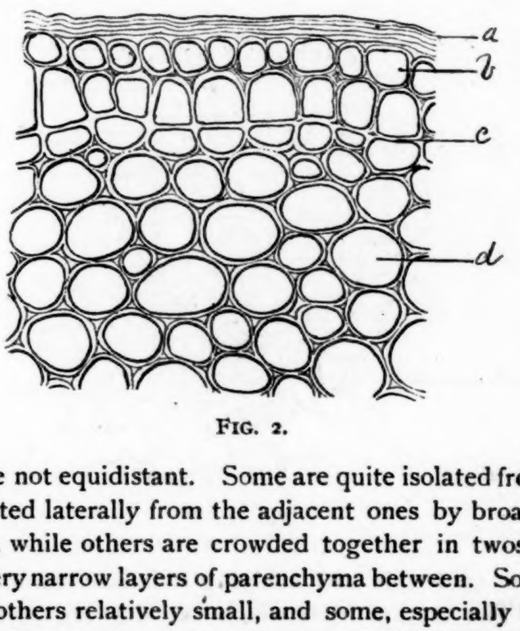

FIG. 2.

the circle are not equidistant. Some are quite isolated from the rest, being separated laterally from the adjacent ones by broad layers of parenchyma, while others are crowded together in twos, threes or fours, with very narrow layers of parenchyma between. Some also are quite large, others relatively small, and some, especially the smaller ones, are a little exterior to the main circle. The number of bundles may be as many as thirty-six; the average, perhaps, is not over twenty.

Fig. 1 shows the transverse section of a rather large rhizome, magnified six diameters. *a* is the corky layer; *b*, one of the vasal bundles in the circle; *c*, a smaller bundle, slightly displaced from the principal circle; *d* is a small bundle in the cortex.

It should be remarked that the above-ground stem possesses a

structure quite different from that of the rhizome. The bundles, instead of being arranged in a circle, are scattered without apparent order through the stem as they are in the stems of monocotyls. This deviation from the dicotyl type is rather remarkable.

The cork cells of the rhizome are formed by the tangential division of the exterior layer of collenchyma cells, that is, of the one immediately underneath the epidermis. Only a few tiers of cork cells are formed, usually three or four, before the epidermis ruptures, and thereafter the thickness of cork does not increase, the scaling off at the surface keeping pace with the growth from within. *Fig. 2* shows a small portion of a cross-section of a rather young rhizome,

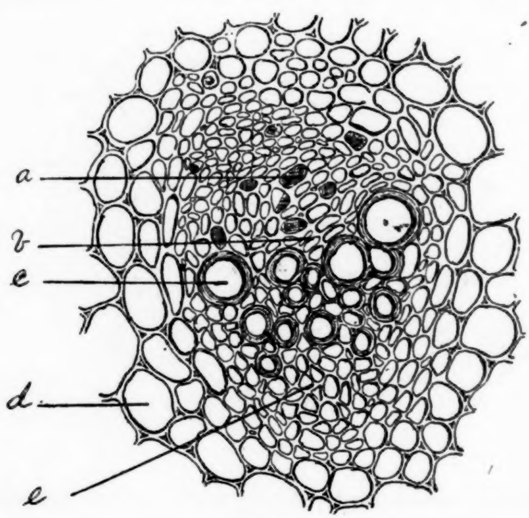

FIG. 3.

including the epidermis and sublying collenchyma, magnified 175 diameters. The section from which the drawing was made was cleared by means of hydrate of chloral solution, which also swells the cell walls, so that in the drawing they are shown of greater thickness than the normal. *a* is the rather thick cuticle; *b*, an epidermal cell; *c*, a tangential partition which has recently been formed across the outer layer of collenchyma cells, the outer of the two tiers of cells thus formed being the young cork, and the inner the phellogen or cork cambium; *d*, collenchyma cell farther interior. The collenchyma in its inner layers passes gradually into parenchyma.

The parenchyma tissues of the rhizome show no special peculiarities. The cells are throughout heavily charged with starch grains.

The vasal bundles are the only portions of the structure which contain lignified tissues and here it is almost confined to the ducts of the xylem. These ducts are of moderate size, rather loosely arranged with soft tissues between, and occurring singly or in groups of a few. The smallest are in the inner part of the bundle and nearly all are either reticulate or scalariform, the one form passing into the other. An occasional spiral duct of small size is found in the inner part of the bundle. The other tissues of the xylem consist chiefly of wood parenchyma, no wood cells being developed.

In the phloem of the bundles are seen sieve tubes of moderate

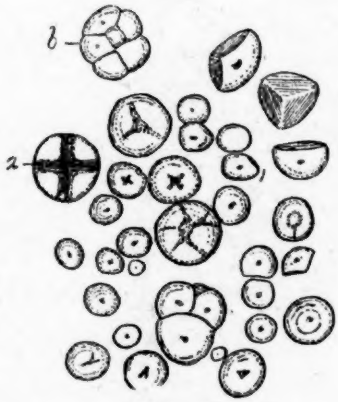

FIG. 4.

size, and companion cells along with other parenchymatous elements. In old rhizomes we find many of the cells of the phloem with the walls collapsed and variously wrinkled. No distinct sheath is traceable about the bundle.

Fig. 3 shows one of the bundles magnified 175 diameters. *a* is a sieve-plate; *b*, meristem tissue; *c*, a duct in the xylem; *d*, a parenchyma cell exterior to the bundle; *e*, wood parenchyma of the bundle.

In the outer part of the phloem there are sometimes, though not always, found a few cells of rather large diameter having somewhat thickened and lignified walls. These, when viewed in longitudinal section, are found to consist each of a single row of elongated cells, which together resemble a bast fibre in appearance. They are, in

fact, probably to be regarded as imperfectly developed bast fibres. The cells contain starch, though not so abundantly as the adjacent parenchyma cells of the cortex. It must be remarked that these fibres do not occur in all the bundles.

Fig. 5 shows one of the small bundles, exterior to the primary circle, magnified 330 diameters. *b, b, b, b, b* are the fibres in question; *c*, a sieve-cell; *d, d, d,* ducts in the xylem; *e*, wood parenchyma; and *a, a,* cortical parenchyma cells.

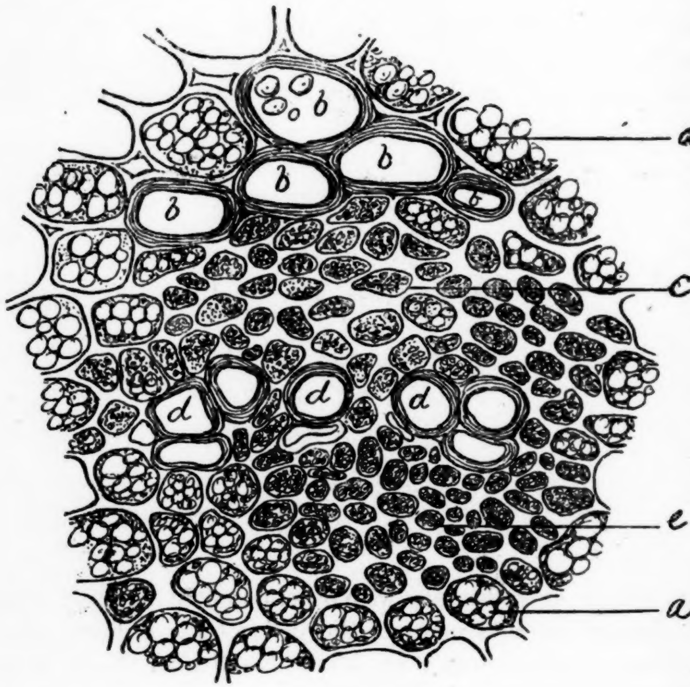

FIG. 5.

Several roots were examined with reference to the structure of the central radial bundle. In the specimens examined, the number of xylem rays in the bundle was found to vary between three and six, the commonest numbers being five and six. The central part is sometimes wholly parenchymatous and sometimes contains scattered ducts. The endodermal sheath is composed of quite regularly arranged cells, all somewhat elongated in a tangential direction, and having the radial walls a little darker in color. The pericambium,

immediately within the endodermis is composed of somewhat larger cells, also somewhat elongated in a tangential direction. The ducts only are lignified.

Fig. 6 shows one of the bundles magnified 175 diameters. The section from which the drawing was made had been cleared of starch and albuminous matters. *a*, a cell of the endodermis; *b*, a cell of the pericambium; *c*, small ducts at the extremity of one of the xylem rays; *d*, phloem.

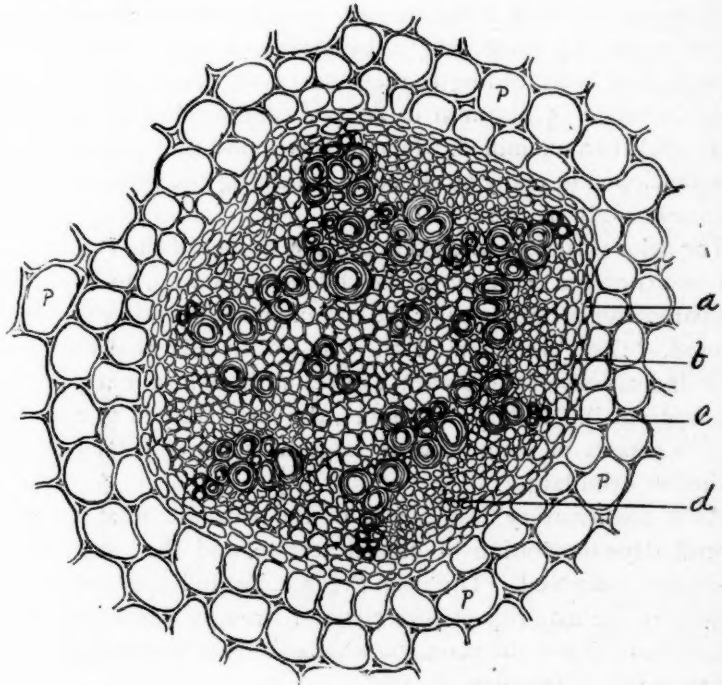

Fig. 6.

The starch of podophyllum (Fig. 4) is rather small-grained and very abundant. Many of the grains are simple and spherical or nearly so, but many others show one or more flat faces, indicating that they have formed a part of a compound grain. Many of the larger grains appear more or less lobulated, and some of those which are nearly perfectly spherical show radial markings extending from the centre nearly to the circumference. These are really compound grains, as is readily shown by treating them with a strong solution of chloral

hydrate in which a little iodine is dissolved, when they separate into their component granules. The hilum is central (though often difficult to see without staining), and the polarization cross is therefore rectangular. A few of the larger simple grains show one or two circular stratification lines, but these as a usual thing are difficult to see without staining.

No special secretion cells and no intercellular secretion reservoirs exist either in the roots or rhizome. The resin that gives to the drug its special value is not directly recognizable in the cells, but its presence may be made known by means of tests. The following were applied, both leading to the same result. Sections were treated with a solution of alcannin in 50 per cent. alcohol for an hour or more and then examined, when it was found that a deep red color was developed in many of the cells, indicating the presence of either resinous or oily matter.

The color was most intense in the soft tissues of the vasal bundles, but the contents of many of the collenchyma cells, and of many of the parenchyma cells, both of the cortex and of the pith were strongly colored. There were few of the thin-walled cells that did not give some indications of the presence of resin, though in many the quantity was small. In a few instances, the resin seemed to exist in the cells in masses of some size, as large as some of the larger starch grains, or even larger.

As a confirmatory test, pieces of the rhizome were soaked for several days in solution of copper acetate, and then sections were made and examined. The deep green color, indicative of resin, was present in the majority of the cells and strongly developed in some. The distribution of the stain was similar to that which was observed as the result of the previous test.

FUNGI.

By Henry Kraemer.

During the past year or two the Fungi have received increased attention by both botanists and chemists. The term fungi by many writers is used to include all of those cryptogams that do not possess chlorophyll. Hence the Saccharomycetes, Schizomycetes, Mucorini and Peronosporeæ are included in this classification. The fungus of

rye—ergot—has been known for many years. The sphacelial stage of development was not known until 1841, when Meyen pointed this out. Literature to-day is filled with the results of different workers who have struggled with the separation of the constituents of ergot. The "rusts" have received careful attention by the Department of Agriculture, and now, very recently, have been issued by the Government Printing Office, Washington, D. C., four important pamphlets on the twenty-four edible and twelve poisonous mushrooms of the United States, with directions for their identification and preparation as food. This is the work of Thomas Taylor, Chief of the Division of Microscopy, and the pamphlets in their timely appearance reflect great credit to the department. At this time, when the fungi are so abundant in our damp woods, we desire to call attention to a scientific and convenient classification of the fungi of the Carposporeæ and to the recent developments in the physiology and chemistry of the same.

CARPOSPOREÆ.

Group.	*Sub-Group.*
I. Basidiomycetes: produce *basidia* containing *basidiospores.*	(1) *Gasteromycetes*—spores produced in closed cavities; e. g., *bovista, phallus.* (2) *Hymenomycetes,* spores not produced in closed cavities; e. g., *hydnum, polyporus.* (3) *Tremellineæ,* jelly-like mass; fruit scattered on the surface; e. g., *tremelline.*
II. Ascomycetes: produce an *asci* in which *ascopores* are contained.	(1) *Discomycetes,* fruit a cup-shaped body—*apothecium;* e. g., *morchellus, peziza.* (2) *Pyrenomycetes,* fruit body—*perithecium*—of various shapes but nearly closed, so that spores are inside; e. g., *claviceps.* (3) *Perisporeaceæ,* fruit body remains closed until it decays; e. g., *erysiphe.*

I. *Basidiomycetes* are saprophytes consisting of a mycelium and sporocarp. The *basidia* are arranged usually to form a hymenium. According as this is external or internal, the two important divisions are made.

Hymenomycetes, hymenium is external.

Gasteromycetes, hymenium is internal.

The sexual organs are supposed to precede the formation of a sporocarp.

(1) *Gasteromycetes* produce a mycelium that penetrates decaying

wood, etc. The sporocarp develops and is really what we term the plant. From basidiospore is produced a *mycelium*. When plants are well fed they produce the *schlerotium*. In a few days the resting stage has arrived and we observe a colorless inner tissue and a black, rind, the cells of which are united into a firm tissue. A hypha branches repeatedly and the ramifications gather into a coil or cluster. This hypha coil forms inside of it (*a*) a nucleus of pale tissue; (*b*) the first rudiment of the stipe; and (*c*) on the outside an envelope of hyphæ, i. e.:

(1) On exterior—a *pseudoparenchyma* (rather thick) tissue.

(2) Centre of two parts: (*a*) *umbrella part* and (*b*) *stipe*.

On the umbrella part we find divisions known as *gills*.

Upon the gills arise a tissue called *trama*.

The outer part of the trama—bearing the spores—is called the *hymenial layer*.

The hymenial layer consists of three kinds of cells:

(*a*) *Cystides*—sterile spore cells.

(*b*) *Paraphyses*—tubular cells without septa or spores.

(*c*) *Basidia*—tubular cells, bearing spores.

The cavities cantaining the spores are called *gleba*.

In the Gasteromycetes we have: Bovista, Lycoperdon, Geaster, Phallus, Cyathus, etc.

(2) The *Hymenomycetes* represent the highest group of the chlorophyll free Carposporeæ. Upon the mycelium arise the young sporocarps. These are composed of parallel hyphæ, which send out lateral branches at the top, forming the umbrella-shaped *pileus*, common in many of the genera. Later an opening arises and a tissue develops between this opening and the margin of the sporocarp, forming the *veil*—which finally, by reason of the rapid growth of the pileus, becomes ruptured. Upon the under side of the pileus develop *gills*, which latter develop upon their surface a hymenial layer, which latter bears *basidia* and also bladded-shaped cells called *cystidia*.

The Hymenomycetes contain the larger fungi, many of which are edible. The important common genera of this group are: Agaricus, Hydnum, Polyporus, Clavaria, etc.

(3) *Tremellineæ* are nearly related to the Hymenomycetes and by some included therein. They are gelatinous fungi, of irregular shape, and on the surface produce a hymenial layer with spores.

The Tremellineæ are found on wet tree trunks rather than on dead branches or upon the ground.

(II) The *Ascomycetes* differ from all other Carposporeæ in producing their spores in sacs. The spores are a result of an act of fertilization. The sexual organs consist of carpogonium and antheridium. As a result of fertilization, a sporocarp is produced (by growth of enveloping cells), which is technically called the *perithecium*. It is frequently appendaged, contains an *ascus* and generally eight *ascospores*.

The methods of reproduction are by:

(*a*) *Ascopores*.

(*b*) Spores called *macrostylospores* produced in a receptacle called *pycnidium*.

(*c*) Spores called *microstylospores* produced in a *spermagonium*.

(*d*) A sexual spore cut off singly or in chains from fruit hypha.

(1) *Discomycetes*, fruit body open entirely from the first or when ripe—called apothecium. They are generally disc-like or cup-shaped saprophytes, frequently attaining large dimensions. It includes Peziza, Ascobolus, Morchella, etc.

(2) *Pyrenomycetes* possess hard or coriaceous tissues, the hymenium is in deep cavities (*perithecia*) with small openings. It includes Claviceps, Sphæria, etc.

(3) *Perisporeaceæ* (Erysiphaceæ) are parasitic plants forming a white film on leaves and stems. The fruit body remains closed until it decays.

In *Gymnoasci* we have plants in which the asci are scattered over the mycelium—not in a fruit body.

Uredineæ, now called *Æcidiomycetes*, produce a cup-shaped fruit (Æcidium-fruit), from the open top spores are discharged. The bottom part forms a hymenium from which new spores arise. The Smuts and Rusts are included here.

Prof. Bourquelot, in a paper read before the Academy of Sciences of Paris, last year, pointed out that the parasitical mushrooms produce a soluble ferment analogous to emulsin. It possesses the property of dissolving various glucosides, as amygdalin, salicin, coniferin, etc. Willow trees, pine trees and poplars, etc., are attacked by various species of fungi. Consequently, argues Bourquelot, owing to this ferment which they secrete, all parasitical mushrooms can utilize the glucosides contained in the trees upon which they

subsist, which under its influence produces a variety of products, among which is glucose.

E. Winterstein, in *Ber. d. Chem. Ges.*, 1893, 3098, records the presence of another carbohydrate—*paradextrin*—besides trehalose in *Boletus edulis.* It possesses the formula $(C_6H_{10}O_5)$ and may be therefore classed among the carbohydrates. From a medicinal standpoint, another interesting property is recorded for *Lycoperdon giganteum,* by Dr. A. L. Hall (*Medical Rec.*, 1893, No. 1186). He has employed it in several cases of nasal hemorrhage with prompt and efficacious results. He considers this Lycoperdon to be superior to many other hemostatics on account of its non-irritating properties.

A most valuable physiological observation has been observed by W. Wahrlich (*Bot. Centralb.*, 1893, 368). He has found a continuation of protoplasm between the cells of all the fungi examined, with the single exception of *Oidium lactis* This has been seen not only between the vegetative cells of the hyphæ, but also between those of the asci and those of the ascospores, and in some cases between the cells of multicellular spores. In all cases, the septum exhibited a single central pore and was traversed by a string of protoplasm of uniform breadth. The pore is not formed by resorption of a portion of the membrane, but exists from the first. This was especially well seen in young cultures of *Achorion Schonleinii.* From the absence of protoplasmic connections in those fungi in which each cell is independently nourished, such as *Oidium,* and in some piliform algæ, Wahrlich concludes that they are the agents for the transport of food material, by means of which the granular protoplasm is conveyed from cell to cell. This was observed directly in *Eurotium repens.*

THE INTERACTION OF BORAX, CARBONATES AND POLYHYDRIC ALCOHOLS; ALSO, THE COMPOSITION OF BORAX.

BY LYMAN F. KEBLER, PH.C., B.S.

It was profoundly stated by Lord Bacon that "In all generations and transformations of bodies, we should inquire what is added, what remains and what is lost; what is united and what is separated." This is the true character of inductive philosophy, careful

observation and rigid analysis. These sentiments are applicable to the questions in hand as well as to the many difficult problems constantly inviting our sober thoughts.

From statements made in certain[1] lines of literature we are led to infer that on mixing *borax, sodium bicarbonate* and *glycerin*, a certain chemical reaction ensues in which there are formed normal sodium carbonate and carbon dioxide. This is equivalent to saying that there is no interaction, as far as the carbonate is concerned, when a normal alkaline carbonate is employed instead of the acid carbonate.

Recently the writer had occasion to establish the presence or absence of sodium bicarbonate as an adulterant in a sample of borax. After having exhausted all the available tests of any standing without any definite results, recourse was sought in the above reaction, but it was soon discovered that the same reaction resulted with the normal carbonate, only less energetic. Being somewhat surprised at this unexpected phenomenon, the writer made an investigation, and soon found that the same result was reported some six years ago by C. Jehn.[2]

D. Klein,[3] and the same year A. Senier[4] and A. J. G. Lowe showed that an acid reaction resulted when borax is dissolved in glycerin. W. R. Dunstan[5] also made a comprehensive report on the reaction of polyhydric alcohols and borax. The acid reaction results not only with the polyhydric alcohol glycerin, but also with many other polyhydric alcohols, as manitol, erythrol, levulose, dextrose, glucose, α—galactose and β—galactose. Undoubtedly many other polyhydric alcohols, as sucrose, raffinose, lactose, dulcitol, quercite, etc., would produce the same results if subjected to the proper conditions.

It is reported that borax is even decomposed by water, for Rose[6] has shown that strong solutions of this salt give precipitates of silver borate, while dilute solutions precipitate argentic oxide, like an alkali.

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[1] National Dispensatory, *5th* Ed., page 1455.
[2] 1888, Arch. der Pharm., (3) **26**, 495; Am. J. Pharm., **60**, 455.
[3] 1878, Bull. Soc. Chim., **29**, 195; Comp. rend. **86**, 826.
[4] 1878, Pharm. J. Trans. (3), **8**, 819.
[5] 1883, Pharm. J. Trans. (3), **13**, 257; Am. J. Pharm. **55**, 447.
[6] Mendeléeff's Principles of Chemistry, Eng. Ed., Vol. **2**, p. 60.

The acidity is unquestionably due to the transformation of the borax into sodium metaborate and boric anhydride, the latter uniting with water to form boric acid. As significant evidence substantiating the above statement, may be noted that no acid reaction results in the absence of water, for on using anhydrous borax, anhydrous glycerin and elevating the temperature so as to expel the water formed during the reaction, no acid reaction results.

A support to the above composition of borax may be found in the formation of tetraboric acid. When orthoboric acid is heated there are formed at 100° C. metaboric acid and water—$H_3BO_3 = HBO_2 + H_2O$; at 160° C. it yields tetraboric acid and water—$4\ H_3BO_3 = H_2B_4O_7 + 5\ H_2O$; at a still higher temperature all the water is eliminated and boric anhydride is formed—$H_2B_4O_7 = 2\ B_2O_3 + H_2O$.

Tetraboric acid is the intermediate compound from which only a portion of the water has been eliminated; that is, it is neither metaboric acid nor boric anhydride, but a mixture of the two. In that borax is a salt of tetraboric acid it must necessarily share an analogous composition. Direct evidence that borax is so constituted is insufficient but indirect evidence appears to be ample.

The avidity of boric acid is unity when nitric acid is taken as one hundred. Boric acid displaces carbonic acid, and *vice versa*, depending on the conditions; consequently the avidity of carbonic acid must be about unity.

It appears to be well established that the acidity, above referred to, is due to boric acid; therefore all carbonates transposable by this acid will evolve carbon dioxide with the simultaneous formation of sodium metaborate and sodium orthoborate when mixed with borax and glycerin.

The following equations present the facts in a most lucid manner:

(1) $2C_3H_5(OH)_3 + Na_2B_4O_7 = 2C_3H_5BO_3 + 2NaBO_2 + 3H_2O$.

(2) $2C_3H_5(OH)_3 + Na_2B_4O_7 + 3H_2O = 2C_3H_5(OH)_3 + 2H_3BO_3 + 2NaBO_2$.

(3) $C_3H_5BO_3 + 3H_2O = C_3H_5(OH)_3 + H_3BO_3$.

(4) $3Na_2CO_3 + 2H_3BO_3 = 2Na_3BO_3 + 3CO_2 + 3H_2O$.

The first equation represents the reaction when there is no water present, that formed being expelled by heat; the second when water is present; the third the action of water on boroglycerol, and the last simply the action of boric acid on an alkaline carbonate.

When calcined sodium carbonate is fused with boric acid ordinary borax is produced.

Boric acid may replace successively the hydroxyl groups of polyhydric alcohols, forming mono-, di-, tri- and poly-products; therefore we may have simultaneously formed one or more products of transformation.

Glycerin here evidently plays the part of a catalytic, as sulphuric acid does in the formation of ether from alcohol. Thus alcohol is not converted into ether and water by boiling alone, but is so converted by boiling with sulphuric acid. The catalytic function of polyhydric alcohols is very clearly typified in the action of glycerin on borax. The quantity of glycerin has neither increased nor decreased, but has nevertheless taken part in the several reactions, which would not have resulted but for the presence of glycerin, or some other polyhydric alcohol, or an aldehyde.

Catalysis has been of no small service in advancing stereometric chemistry through the agency of micro-organisms, so admirably adapted for mesotomising various asymmetric carbon compounds, as the amylic alcohols, propylene glycol, mandelic acid, glyceric acid and many others, through the agency of organized ferments, such as *penicillium glauca*, *bacterium termo*, etc.

Unfortunately we do not possess, in the inorganic field, an invaluable polariscope, which will reveal to us at a glance the ultimate transformations of a body under given conditions.

LABORATORY, SMITH, KLINE & FRENCH CO.

PHILADELPHIA, July 18, 1894.

FOLIA SCOPOLIÆ CARNIOLICÆ.

By J. B. NAGELVOORT.

Since Professor E. Schmidt (Marburg) has established a place for *scopolamine*, which is due it in the list of alkaloids, it may be welcome to the readers of the AMERICAN JOURNAL OF PHARMACY to have a record of an answer to the question: Do the leaves of *Scopolia carniolica* also contain scopolamine?

The writer has been in a favorable position to speak on this subject, as I have, for the past two years, had a vigorous plant of *scopolia carniolica* in my garden for the purpose of identifying its alkaloid with commercial hyoscine.

The plant answered to the description given in De Candolle's *Prodomus*.

There is very little analogy in the vegetable kingdom to guide one in predicting the presence of an alkaloid. The leaves of *Conium maculatum* contain only a minute quantity of coniine; the leaves of most of the *Solanaceæ*, *Ranunculaceæ* and *Umbelliferæ* are reputed to be poisonous, yet there are plants in those very families which are perfectly harmless. We see in the tomato (a Solanea) what cultivation will do for a poisonous plant. Coca and tea leaves only need mentioning.

The scopolia was cultivated, and cultivated plants are very frequently poorer in alkaloidal strength than those growing wild. Such freaks of nature are frequently met with. Cinchona is a brilliant exception. It is a mooted question yet about cultivated ipecac. I have assayed roots cultivated in India, but have not found any higher percentage of total alkaloids in them, than in those gathered wild in the South American forests.

I collected a little over thirty grams of air-dry leaves from my scopolia plant. On submitting 7·5 grams to an exhaustion process with the well-known Prollius' mixture, in the usual way, neither gold chloride nor Vitali's test for mydriatic alkaloids yielded a reaction with the residue obtained as the last step in the analysis. Hyoscine always gives me both identity reactions.

Twenty-five grams of air-dry leaves were thereupon exhausted with 75 per cent. alcohol; the latter was evaporated at a temperature not exceeding 50° C. The residue was exhausted with acidulated water; this latter was washed with benzine, then made alkaline and extracted with a mixture of ether and chloroform. The experiments on the presence of an alkaloid were *totally negative*.

The reader will please bear in mind that this is an isolated case. It is not an unfrequent occurrence that great fluctuations are found in the alkaloidal strength of our medicinal plants.

DETROIT, August 1, 1894.

THE OPIUM ASSAY METHOD OF THE NEW PHARMACOPŒIA.

By Frank X. Moerk, Ph.G.

Owing, no doubt, to the legal requirements that no opium shall enter this country having less than 9 per cent. of morphine, this drug stands at the head of the list, if we consider the number of methods of assay that have been published; a large number of the methods are simply modifications of two or three fundamental ones which, themselves, can be placed into one of two classes depending upon the extraction of the opium; if this is carried to completion, and the finished assay represents the whole quantity of opium started with, we get the process of Dr. Squibb and its numerous modifications; if, on the other hand, the opium is macerated with a definite weight of water and the assay is finished by the use of an aliquot part of this aqueous solution, we get the methods proposed by Professor Flückiger, by E. Dieterich (adopted by several European pharmacopœias), that adopted by the United States Pharmacopœia of 1880 (the so-called lime process), etc., etc.

Some of the objections which Dr. Squibb sets forth against the trustworthiness of this second class of assays are convincing. His determinations of the quantity of extractive matter in opium show that this is subject to considerable variation; in one of his publications he quotes the figures obtained in the examination of the last eleven lots of opium in which the dry, insoluble residue amounted to from 25 to 42 per cent. (average 32 per cent.); this, of course, means that the substances extracted (extractive matter and moisture) varied from 58 to 75 per cent. (average 68 per cent.); the methods, therefore, like those of Flückiger and Dieterich, in which is assumed that all opiums yield 60 per cent. to water, cannot be considered reliable, because based upon something which is proven to be variable. While this objection is undoubtedly correct and it is believed that *comparable* figures would indicate the same relative variation, it must be remembered that in Squibb's process one part opium is extracted with about thirty-two parts of water, while in Dieterich's process only eight parts water are used for one part opium; it is evident, therefore, that the former must extract considerable more of the difficultly soluble opium constituents than the latter, and hence, a partial extraction *cannot be compared* with an

(intended) complete extraction, although this is not even attained by the process of Squibb, as he himself calls attention to the color and the bitter taste imparted to water after extracting the opium with thirty-two parts of water.

A second objection to these methods is that the morphine is precipitated from a too dilute solution, the morphine remaining in solution depending upon the quantity of the mother-liquor, and claims as a special value of his method the precipitation from a concentrated solution. Dieterich, by a method to be given later, claims to have determined the morphine left in the mother-liquor of his process, and states it to vary from 0·2 to 0·65 per cent., depending upon the kind of opium and the solvent used to remove narcotine, etc. (using ether as this liquid 0·44–0·66 per cent., using acetic ether 0·18–0·57 per cent.); upon the strength of these determinations Dieterich announces that the aqueous solution (1 : 8) from which he precipitates the morphine is a poorer solvent for morphine than an aqueous solution containing the same quantity of ammonia; this favorable result he believes to be due to the presence of the extractive matter of the opium which facilitates the precipitation of the morphine.

In Squibb's process the aqueous extract, concentrated to twice the weight of the opium, is mixed with half its weight of alcohol, making about a 30 per cent. alcohol solution, although the subsequent addition of ether removes part of the alcohol, and leaves a more dilute alcoholic liquid saturated with ether; the alcohol is absolutely necessary in this process to keep the large amount of coloring matter from precipitating with the morphine. Dr. Squibb quotes that an investigator, probably P. Carles, determined that a 33 per cent. alcohol had a low solvent power for morphine, and repeatedly calls attention to the fact that his process indicates all of the morphine except that remaining in the mother-liquor, which, of course, constitutes a saturated solution; no attempt has been made to ascertain what amount is retained in the mother-liquor, but it is stated that the mother-liquor has a somewhat variable solvent power for morphine, greater for morphine in the nascent state than for morphine added to it; the solvent power is greater than that of a clean solution of alcohol and water made to represent the mother-liquor; the precipitation of coloring and other matter which may finally be weighed with the morphine will not more than counter-

balance the quantity of morphine lost to the assay by remaining dissolved in the mother-liquor and washings. In Vol. III, No. 2, page 965, of the "Ephemeris" (published in October, 1887) is found the following paragraph: "The process has been criticised as yielding results that were too high. This criticism can only be justified by weighing substances as morphine which are not morphine, and it is feared that this may have been done through a fault in the original paper in regard to the lime-water testing of the results, in order to correct them by the subtraction of matters insoluble in lime-water. This is given in the paper, without particular emphasis, and merely as a test for the presence or absence of narcotine, when, though narcotine can hardly ever be present, other matters equally insoluble with narcotine are very often thrown down with the morphine and must be filtered out, weighed and subtracted for a proper correction of the results."

In 1886, Dieterich published the results of experiments, proving that the presence of alcohol in the liquor (made 1:10 at that time) from which morphine is precipitated, caused also the precipitation of calcium meconate, which was estimated by igniting the morphine and calculating from the ash which was stated to be *pure calcium carbonate;* the results were expressed in the statement:

"The separation of the morphine proceeds slowly, and with the least quantity of lime salts if allowed to stand quietly; proportionate to the amount of agitation the separation of the morphine proceeds more quickly, is more abundant and contains more lime salt."

The addition of alcohol is objected to by Dieterich as of vital importance, since morphine is soluble in alcohol, therefore the alcoholic mother-liquor will always retain more morphine than an aqueous mother-liquor. Professor Flückiger, in one of his articles on opium assaying, admits that the amount of morphine lost to the assay depends especially upon the quantity of alcohol present; the smaller the quantity, the smaller the loss; the greater the quantity the purer the precipitated morphine. To one of these objections relating to the presence of alcohol the view of Dr. Squibb has been given; the other relating to the precipitation of calcium salts in the presence of alcohol is admitted as having been "experimentally demonstrated to be sound." Dr. Squibb then continues:

"But then he (Dieterich) precipitated from so large a volume of liquid as to vitiate his conclusions if applied to small volumes of

liquid. He precipitated the morphine from solutions weighing five, six, seven, eight and ten times the weight of the opium and gets his best results from a solution of eight times the weight. Thus he prefers a solution of eighty grams for precipitation, while this writer (Squibb) prefers one of twenty grams, and it will easily be seen that the presence of alcohol in these two solutions will have a very different bearing upon the results."

In the controversy between these two defenders of the two methods of opium assays their objects should not be lost sight of. Dr. Squibb aims to ascertain as near as possible the total quantity of morphine in the opium; to accomplish this he spares neither time nor labor in the extraction of the opium, and does not object to the further examination of his morphine for purity and, in fact, as already stated, claims that it is necessary to correct the results for matters precipitated which are not morphine; his claim for the method is that the assays will only vary within 0·2 to 0·3 per cent. E. Dieterich aims to perfect a process which is expeditious, which will yield a pure morphine not requiring a subsequent correction of results, which will give results agreeing within 0·3 per cent., and which will indicate to within 0·5 per cent. the morphine in the opium, which is claimed to be sufficiently accurate for pharmaceutical purposes; (this apparently is the extent of the morphine left in the mother-liquor and does not include the variable source of error due to the taking of an aliquot part of the filtrate).

In the AMERICAN JOURNAL OF PHARMACY, 1891, p. 113, was published a paper by Mr. Wm. T. Hankey, in which it was shown that the morphine by Squibb's process always yielded some ash upon ignition; the ash is stated to be calcium oxide, due to the decomposition of calcium meconate, and the factor 4·55 is given to convert the calcium oxide into meconate, which then is to be subtracted from the weight of the crude morphine. A careful reading of this paper does not show that an examination of the ash was made, but finding that the ash calculated to calcium meconate by the above factor gave an almost identical figure with the insoluble residue left upon treating the crude morphine with hot absolute alcohol as directed by C. M. Stillwell in his correction of results by Squibb's process, and which residue is by him (Stillwell) stated to be calcium meconate, it was an easy matter to forego this examination. The corrections to be made according to this paper vary from 0·59 to

2·23 per cent.; the correction by the use of lime-water is stated to be less convenient and less accurate than by the use of alcohol, and not to be compared with the ash method, but no figures substantiate this statement. Other publications could be quoted showing the impurity of the morphine by Squibb's process, but more appears useless since the author of the method insists upon a necessary correction.

One other point may be mentioned here concerning the influence of an excess of the morphine precipitant, ammonia: E Dieterich, in his dilute solutions, finds that the ammonia may be present in pretty fair excess without affecting the results, while Dr. Squibb has found that an excess of ammonia will prevent the precipitation of the maximum quantity of morphine, and advises that the quantity of ammonia be reduced for inferior samples of opium.

This review of the important points in opium assaying is not occasioned by the desire to offer a new process, but to assist in the explanation of some observations recently made while assaying two samples of opium; these observations, it is hoped, will be confirmed by others working in this line of assay work; the suggestions made must not be considered as reserving to the writer this field of work, but as an invitation for the co-operation of all desiring to have this opium assay method perfected.

The process adopted by the pharmacopœia of 1890 is that of Dr. Squibb with the improvement, originally proposed by E. T. Teschemacher, of washing the crude morphine with morphiated alcohol (Teschemacher's morphiated spirit contained some ammonia, whereas the pharmacopœia uses simply alcohol saturated with morphine) and with the serious oversight of not giving a test for the purity of the weighed morphine; this need not be amplified upon, as the previous and subsequent parts of the paper prove the necessity.

A sample of powdered opium was used for the first set of assays; the pharmacopœia process was followed until the washing with alcohol and ether was directed, so that by simply washing with water we have the original process of Dr. Squibb. To determine if it was necessary to postpone evaporation of the opium filtrate until the second filtrate was ready, in Nos. 2 and 3, the first filtrate was used as soon as obtained, and the second filtrate added to the concentrated first filtrate; the results would indicate that no loss of

morphine is incurred by this manipulation. The results are tabulated and necessary explanations follow:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Hours allowed for the precipitation of the morphine.	17	18	18	41	41
Quantity (cc.) of wash water used.	15	20	20	30	30
Weight of crude morphine on weighed filter.	1·6315	1·5675	1·5595	1·5495	1·5075
Weight of same on watch crystal.	1·560	1·526	1·498	1·479	1·454
Impurity taken up by the weighed filter.	0·0715	0·0415	0·0615	0·0705	0·0535
Ash as $CaCO_3$ from 1 gram crude morphine.	0·052	0·0505	0·042	0·0425	0·0425
Ash $\times$ 2·56 = calcium meconate; calculated for entire weight of morphine.	0·208	0·197	0·161	0·161	0·158
Corrected weight of morphine.	1·352	1·329	1·337	1·318	1·296

In washing the morphine from Nos. 1–3 with water, it was noticed that the washings were turbid, and that after mixing with the mother-liquor, a very distinct and increasing precipitate commenced to form, so that in Nos. 4 and 5, the mother-liquors and washings were collected separately; this procedure enabled me to show that by keeping these mother-liquors for about a month, only a very slight further precipitation took place, while in the washings a very notable quantity of a fine whitish or pale brownish precipitate separated in a very short time, this apparently was part of the precipitate collected upon the filter and caused to run through the filters after the mother-liquor was replaced by the wash water; the differences in weight of the crude morphine are undoubtedly due, in part at least, to the varying quantities of water used in washing, which removed not only more or less of the coloring matter, but also more or less of the above fine precipitate; attempts to collect this fine precipitate upon a filter were only partly successful, as a considerable portion ran through the filter; it was afterward obtained by

allowing to settle and washing by decantation. In experiments made by Dr. Squibb upon the respective merits of the alcohol and the lime-water corrections for the impurities in the crude morphine, reference is made to the difficulty of filtering the alcoholic solution; the insoluble matter, owing to its being an extremely fine powder, was very apt to run through the filter. Finding that both methods gave practically the same correction, Dr. Squibb determined to continue to use the lime-water test as here given, there was no difficulty in filtering. To one of these mother-liquors (No. 5), after standing for about a month, was added as much water as was used in washing and set aside for a week, when, to all appearances, a somewhat increased precipitate was to be noticed; lack of time not permitting an investigation of this precipitate, it would not seem justifiable to state this additional precipitate to be *morphine* thrown out by diluting the alcoholic mother-liquor with water.

In determining the purity of the morphine by the ignition method one gram was taken and by the careful application of heat, the morphine was first charred (in this part of the operation it was possible to find in the upper part of the crucible or on the lid, very well formed crystals of morphine) and then by the application of more heat, the crucible contents incinerated at a low red heat; the ignition of the ash so as to form calcium oxide, while suitable for those having all laboratory conveniences, is not often suitable for the pharmacist, therefore, the ash obtained at a low red heat is best moistened, after cooling, with a few drops of solution of ammonium carbonate, and gently heated first until dry and then at a very low red heat; this will insure the ash to consist of carbonate which, multiplied by the factor 2·56, gives the corresponding quantity of meconate. This alteration had, as a consequence, the examination of the ash, for on moistening with water and ascertaining its effect upon litmus paper, I was surprised to find a very strong alkaline reaction (no matter how small the quantity of ash, an alkaline reaction was always observed with litmus paper); as this could not be due to caustic lime, because the treatment with ammonium carbonate was for the express purpose of changing any caustic lime into the carbonate, the only other explanation, which was verified, was that alkaline carbonates were present; upon filtering off the ash insoluble in water and adding hydrochloric acid to the filtrate, a very distinct effervescence was noticeable; this acid solution gave

tests for potassium and sodium, also for sulphuric acid; the part insoluble in water was composed very largely of carbonates, but was not entirely soluble in the mineral acids due to a small quantity of silica which is present; the acid solution gave tests for aluminum, phosphoric acid and magnesium, but calcium salts were the chief constituents. This examination of the ash (if the opium was not an exceptional sample) makes the correction based upon it an exceedingly arbitrary one; therefore, while in the next set of experiments this correction is still used, it is only for comparison with the lime-water test.

The precipitation of such a complex mixture of salts of the metals, is, in all probability, due to the use of so much water in the extraction which dissolves considerable of the opium constituents only slightly soluble in water, (the residue from the opium extraction treated with more water gave an acid filtrate with which the meconic acid test could always be obtained and with which the test for calcium succeeded at times); the concentrating of these acidulous filtrates involves no precipitation of mineral matter due to the accompanying concentration of the acid present, the addition of alcohol even to the concentrated solution produces no precipitation (in the course of three to four hours), probably due to the solubility of meconic acid and the acid meconates in the diluted alcohol; the precipitation is caused by the addition of ammonia, changing the acid into an alkaline reaction, but is not immediate, requiring probably as much as three hours before it commences, and probably as much as thirty-six to forty hours before it is complete.

In the AMERICAN JOURNAL OF PHARMACY, 1891, page 164, was published a paper by Dr. Alfred Dohme, on "The Chemistry of Opium," in which the following quantitative analysis of the ash is recorded:

Ash equals 3·89 per cent. containing in 100 parts:

Silica, 11·14; phosphoric oxide, 8·07; sulphuric oxide, 28·39; ferric oxide, 1·98; calcium oxide, 9·04; magnesia, 8·31; potassium oxide, 30·19; carbonic oxide, hydrochloric acid and not determined constituents, 2·88; one of the conclusions arrived at in this paper, namely, "that the silica in opium is present in the form of sand" cannot be accepted as being entirely correct, since some silica was found in the ash of the crude morphine, and this must have been present in solution. The finding of such a large quantity of potas-

sium salts in the ash of opium explains its possible presence in the precipitated morphine.

As the ash is no doubt caused by the ignition of that portion of the precipitate not morphine which remains upon the filter, a few experiments made with the precipitate obtained from the wash waters may be mentioned: A little of the precipitate with hydrochloric acid and ferric chloride gave the test for meconic acid; a little of it ignited, moistened with ammonium carbonate, dried and again ignited, gave a residue having an alkaline reaction towards litmus paper, showing the presence of soluble alkaline carbonates and proving the sparing solubility of the salt giving rise thereto; a larger quantity did not appear to be much acted upon by dilute hydrochloric acid until it was heated, then it dissolved forming a brownish-colored solution, upon cooling, however, a bulky deposit of crystals separated (agreeing with statements in text-books regarding the formation of calcium bimeconate from calcium meconate), the addition of alcohol to make about a 33 per cent. alcohol caused the solution of almost the entire quantity of crystals; if to this solution a small quantity of ammonia was added there was instantly produced the separation of a very fine almost white precipitate; an aqueous opium solution evaporated to dryness with calcium hydrate can be extracted with a 33 per cent. alcohol without showing traces of meconates, a 10 per cent. alcohol does not yield unmistakable signs of meconates. These experiments substantiate the explanation of the separation of this precipitate along with the morphine.

In the second set of experiments six assays were made, in all of which, excepting No. 4, the pharmacopœial directions were carefully followed; in No. 4, the alcohol was omitted, and, hence, a morphine was obtained having very much the appearance of powdered opium. Nos. 1 to 4 were made with the powdered opium previously used, Nos. 5 and 6 were made with the same sample of gum opium, but the assays were made about two weeks apart.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Hours allowed for the precipitation of the morphine.	6½	7	21	7	6	21
Weight of crude morphine in counter-balanced filters.	1·263	1·329	1·4505	1·403	1·235	1·275
Weight of crude morphine removed to watch-crystal.	1·2555	1·313	1·451	1·3925	1·2305	1·267
Difference between these two weighings.	0·0075	0·016	—	0·0105	0·0645	0·008
Ash as calcium carbonate from 0·5 gram crude morphine.	0·002	0·012	0·0195	0·002	0·001	0·0135
Correction based upon the ash calculated to whole weight of morphine.	0·013	0·081	0·145	0·014	0·0063	0·088
Corrected weight of morphine.	1·2425	1·232	1·306	1·378	1·224	1·187
0·5 gram crude morphine dissolved in 50 cc. lime water left a residue weighing.	0·0025	0·030	0·064	0·0205	0·001	0·031
The lime water residue calculated to entire weight of morphine.	0·0062	0·079	0·186	0·057	0·0035	0·079
Corrected weight of morphine.	1·249	1 234	1·265	1·335	1.228	1·196

In these assays, the ethereal solutions and the mother-liquor were collected together, while each of the washing liquids—water, alcohol and ether—were collected separately.

In washing with water the same turbidity and separation of precipitate was noticed as before; the aqueous washings amounted to about thirty cubic centimetres to give an almost colorless filtrate, in all

cases the very last portions gave the test for meconic acid. The washing with alcohol is an improvement, since in every instance color was removed from the morphine; about fifteen cubic centimetres of the morphiated alcohol were used to obtain a practically colorless filtrate, in No. 4 about thirty cubic centimetres were used and then the alcohol was still colored (hence, in this process, washing the morphine with alcohol cannot replace the alcohol in the mother-liquor); the filters in the assays, excepting Nos. 3 and 4, were hardly stained after taking off the pale yellow morphine, which speaks well for this improvement of Squibb's process. The alcohol is here shown to be absolutely necessary; the appearance of the ethereal layer collected with the mother-liquor was, in all cases where alcohol was used, of a dark brown color; in the one case where alcohol was not used, it was only light yellow, so that the alcohol not only keeps the coloring matter dissolved in aqueous solution, but causes considerable of it to pass into the ethereal solution.

The use of the morphiated alcohol is sometimes stated to be only for the mechanical displacement of the water held by the morphine crystals, but this is not believed to be going far enough since we have here a means of getting rid of one of the impurities of the morphine without causing any appreciable error; the best method of applying this alcoholic morphine solution is to distribute two to three cubic centimetres at a time over the filter and precipitate and then covering with a watch-glass until dropping ceases, when another portion is added; the use of fifteen cubic centimetres cannot occasion a loss amounting to one cubic centimetre if carried out as directed. Considering the error possible by the evaporation of the alcohol with separation of morphine on the inner filter, which will then be weighed as though belonging to the assay, the following figures will give information: The pharmacopœia gives the solubility of morphine in alcohol as 1:300; E. Dieterich, 1:166. Dr. Squibb (in speaking of the purification of crude morphine by Stillwell's procedure, says 0·5 morphine will require about seventy-five cubic centimetres alcohol to dissolve it and hold it in solution when cold) makes the solubility in alcohol even greater; taking the last as 1:150, the fifteen cubic centimetres (approximately twelve grams) will hold in solution about 0·080 morphine, so that the largest possible error that could be incurred by the evaporation of all the alco-

hol would be 0·8 per cent., but guarding against loss by evaporation as directed and allowing a loss of one cubic centimetre, which is considered high, the loss is not greater than 0·05 per cent.

In this connection two sources of error may be mentioned, if the washing with alcohol and ether is not effected as promptly as possible; the first addition of the alcoholic solution to the water-wet crystals has, as a consequence, the formation of a dilute alcohol in which morphine is less soluble and hence may crystallize out; the addition of ether to an alcoholic solution of morphine lessens the solubility of morphine in alcohol, and again, a separation will take place. In collecting the wash-liquids, crystals were always observed to form, but never in the short time necessary to carry through these operations.

The mother-liquors set aside commenced to show additional precipitations, the quantity of these precipitates increased in the order given, 6, 3, 4, 5, 2 and 1, the first three containing notably less than the last three. What the deposit is has not yet been determined; from the assays 1, 2 and 3 it would seem to be matter not morphine, for we notice here that the correction increases with the length of time for precipitation. The second precipitate appears to vary indirectly with the time allowed for the first precipitation. Dr. Squibb, in referring to the length of time necessary for the precipitation of morphine, states that it is not surely complete in less than eight to ten hours, and considers it better to allow it to stand over night; as the results obtained in assays allowed to stand over night and those allowed to stand only six hours do not differ by more than 0·3 per cent., the claim of accuracy made for the method, it would appear that the supposition of Dr. Squibb that the second precipitate is meconate of calcium is, in the main, correct (it seems undoubtedly to be the mixture of salts giving rise to the ash and to the lime-water residue).

A study of the corrections by the ignition and the lime-water tests shows results that agree closely where the morphine, to start with, was practically free from color; in Nos. 3 and 4 the ignition method gives a correction which is too low, because the contaminating coloring matter is free from ash, and hence, the amount of color is recorded as pure morphine; this is another serious objection to this method, although its use is extended through the alcohol washing successfully removing color, except when the precipitation

occupies a long time. The correction by the lime-water test is more satisfactory, since the coloring matter precipitated from alkaline solution is not likely to dissolve in lime-water; to what extent the salts yielding the ash are dissolved by it is not known, but the lime-water solution of morphine gave, in every case, the test for meconic acid when acidified with hydrochloric acid and ferric chloride added, in Nos. 1, 4 and 5, where the quantity of ash was trifling, care had to be exercised so as to avoid an excess of the reagents which were found to interfere with the test.

As for narcotine, which is sometimes stated to be precipitated in this assay method, the ignition method and Stilwell's method will record narcotine as pure morphine, as narcotine, like morphine, leaves no ash; and again, both are soluble in alcohol; the lime-water test rejects all but traces of it, so that this again forms the best test. E. Dieterich, in examining morphine for narcotine, uses ether, which is a much better solvent for the latter than for the former.

The lime-water test is very easily applied so as to prevent frothing, which prevents the solvent action of the lime-water upon those particles entangled in the froth, by moistening 0·5 gram morphine very thoroughly with 5 cubic centimetres lime-water, and then adding the balance of 45 cubic centimetres; the contents are not to be violently agitated, but simply to be rotated frequently during half an hour, when the solution and precipitate, if any, are filtered through a pair of counterbalanced filters, the latter washed with 5 cubic centimetres of lime-water, then with 5 cubic centimetres distilled water, pressed between bibulous paper and dried at the same temperature at which the morphine was dried; if the drying was effected at 100° C., the lime-water residue must be subtracted before the calculation is made changing anhydrous into crystallized morphine.

From the foregoing will be seen the necessity for the following suggestions, embracing corrections and original investigations for the perfection of the official process:

(1) A test for the purity of the weighed morphine.

(2) Information as to the necessary time for the maximum precipitation of morphine.

(3) Information as to the quantity of morphine left in the mother-liquor.

(4) Information as to the nature of the second precipitation (which Dr. Squibb states is probably meconate of calcium), and its effects, if any, upon the yield of morphine, if the assay be allowed to stand until no further precipitation takes place.

(5) Information as to the error involved by the solubility of the morphine impurities in the lime water test for the purity of morphine.

The following remarks may be of assistance in following up this matter:

(2), (3) and (4) will be helped along by collecting the ethereal solutions, the mother-liquors, and the several washings in separate containers. To solve (3) the mother-liquor and the aqueous washings must be taken together, freed from precipitate (which is to be examined separately for morphine), and then shaken out with two portions of chloroform of 30 cubic centimetres each, as first carried out by Dieterich (in Dieterich's process alcohol was added to the mother-liquor to make about a 20 per cent. alcohol solution before shaking with chloroform), the chloroform solution is evaporated to dryness, the residue dissolved in 2 cubic centimetres *n.* sulphuric acid, adding 3 cubic centimetres water, and 2 cubic centimetres *n.* ammonia, filtering, washing the filter and precipitate with a little water, mixing the filtrate and washings with 2 grams ether and 0·5 cubic centimetres *n.* ammonia, and setting aside for twenty-four hours to allow the crystallization of the morphine; by this method he claims to ascertain the entire quantity of morphine left in the mother-liquor varying from 0.2–0·65 per cent.

(5) can very likely be solved by collecting the precipitates occurring in the mother-liquor and aqueous washing, drying, taking a definite weight (0·5 gram) and putting it through the lime-water test; the difference in weight before and after will indicate the quantity going into solution; as a control experiment this purified precipitate can be tested a second time by solution in lime-water.

ON AMERICAN ISINGLASS AS A SUBSTITUTE FOR GELATIN-PRODUCING TISSUE IN THE QUANTITATIVE ESTIMATION OF TANNIC ACID.

By Prof. W. T. Wenzell.

The absorption of tannic acid by means of gelatin-producing tissue, such as hide powder, bone and horn, has, of late, obtained the most general recognition in the estimation of tannic acid by the method known as that of Löwenthal. This method, which was found to be more convenient, expeditious and productive of uniformity as to results, having superseded the precipitation of tannic acid by means of isinglass or gelatin solutions, consists essentially in the titration of a tannic acid solution mixed with an indigo solution acidulated with sulphuric acid, by means of a solution of potassium permanganate standardized, either pure tannic acid or oxalic acid.

Aside from these reagents there is also a substance required which possesses the property of absorbing or withdrawing tannic acid from its solutions, in order to determine in the liquid, after the withdrawal of the tannic acid, the amount of other substances capable of oxidation by the permanganate solution, and designated simply by the name of non-tannins. The titre of the permanganate solution should be, according to Professor von Schroeder, of such strength that one cubic centimetre equals 0·001747 grams of tannic acid.

It is not within the province of the writer to enter into the details regarding the subject under consideration, as ample directions will be found touching the method of Löwenthal in a report from Dr. C. Councler in the transactions of a commission appointed to investigate critically and devise a uniform method for the determination of tannic acid.

The object of this paper is simply to draw the attention of chemists to a substance which is readily obtained and easily prepared, and is par excellence in every way a desirable substitute for the various gelatin-producing tissues at the present time in use. This substance, called American Isinglass, or occasionally ribbon isinglass, occurs in thin ribbons several feet long, and from an inch and a half to two inches in width. It is less soluble than the Russian. It is obtained from the air bladder of the common hake (*Gadus merluccius*). This is thrown into water to macerate for a little

while, and is then taken out and pressed between two iron rollers, by which it is elongated to the extent of half a yard or more.

In order to prepare this isinglass for the purpose here indicated, it is packed moderately firmly into a conical glass percolator, having its lower orifice corked, covered with distilled water and allowed to stand about twelve hours. Then the cork is removed and the water allowed to drain. The cork is then replaced, more water poured on to cover the isinglass, and the operation repeated about four times or more until the water that drains away is not affected on the addition of a solution of tannic acid. During the warm weather, or if the isinglass should acquire odor indicating putrefactive decomposition, the addition of about 10 per cent. of alcohol to the water will be necessary. The isinglass is then transferred to a muslin strainer, and strongly expressed in order to remove as much of the water as possible. The moist mass is then to be returned to the percolator covered with stronger alcohol, allowed to stand twelve hours, transferred to the strainer and again expressed. The cake of isinglass is finally spread out by picking it apart, and laid on glass or porcelain plates, and allowed to dry in a current of air.

It will be seen that the mode of preparing this isinglass for detannating solutions is an exceedingly simple process, standing strongly in contrast with the preparation of hide powder as directed by Professor von Schroeder. The main difficulty in reducing the purified and dried hide to the state of fine powder seems to be its toughness. Fresh depilated hide is to be kneaded repeatedly daily in running water for eight to ten days, or until the water fails to remove anything soluble in it. The hide having now become nearly white, is then to be cut up into squares of three to four millimetres, these dried on a water-bath at 100° C., and finally ground to a fine powder in a suitable mill. During the grinding, the hide will have to be kept drying at intervals on the water-bath, so as to enable it to be wholly ground up.

Where time is an object it will be seen that American isinglass should be greatly preferred, inasmuch as its preparation stands in the ratio of three days to twelve days for the hide powder. Also in the application of the former for detannating purposes its superiority is manifest. Professor von Schroeder directs 3 grams of the hide powder to be used for 50 cubic centimetres of a decoction of oak bark, having a strength of 2 grams in a litre. He covers

the hide powder with water, allows it to swell about twenty hours, and expresses the water through a wetted linen cloth. The moistened powder is then put into a glass flask holding 150 cubic centimetres, and 50 cubic centimetres of the decoction added, the whole vigorously shaken and allowed to stand from ten to twenty hours, with occasional shaking. It is then to be poured upon a dry filter, and of the filtrate 10 cubic centimetres are to be taken for the titration.

Of the isinglass as prepared by the writer, 1 gram appears to be sufficient for detannating 50 cubic centimetres of the decoction. The isinglass is added to 50 cubic centimetres of water contained in a flask of 150 cubic centimetres capacity, allowed to swell about fifteen minutes, and vigorously shaken. The violent agitation causes the isinglass to break up into a pulpy condition. It is then to be transferred to a muslin strainer, and as much water as possible squeezed out. The moist mass of isinglass is then transferred to the flask containing 50 cubic centimetres of the decoction of oak bark, and the whole well shaken for about fifteen minutes, when the decoction will be found to be detannated and ready; when filtered for titration, it will be seen that whilst by the use of hide powder it will require twenty hours to swell it, and twenty hours more to absorb the tannic acid, the same results will be obtained by the use of the isinglass in about half an hour. Prepared isinglass is, therefore, to be preferred, not only on account of the facility with which it is prepared and the expeditious way in which it absorbs tannic acid, but also its cheapness.

THE APOCYNACEÆ IN MATERIA MEDICA.[1]

By George M. Beringer.

GENERAL KNOWLEDGE OF THE FAMILY.

Morphology.—Very rarely herbaceous and in all cases perennial plants, the Apocynaceæ are trees, shrubs or woody climbers, and in

[1] The material in this paper is abstracted from that valuable monograph recently issued, entitled "*Produits Fournis a la Matière Médicale par la Famille des Apocynées*, par Louis Planchon, Docteur en Médecine, Licencié ès Sciences Naturelles, Pharmacien Supérieur, Chargé du Cours de Matière Médicale a L'École Supérieure de Pharmacie de Montpelier, Membre Correspondant

this case the twining is to the right, or they maintain themselves upon the trees without rolling about them. *Branches* often fleshy or thorny, always traversed as elsewhere in the entire plant by laticiferous canals with a white juice, or more rarely opalescent. The subterranean parts, *roots*, or sometimes rhizomes, may be swollen with tubercles. In the same genus as the Dipladenia, D. C., for example, we find in the Campos of Brazil the plants herbaceous or suffruticose, often tubercular with erect branches (Eudipladenia), and in the region of the forests the long, twining climber (liane) elevating itself upon the tallest trees (Micradenia).

Leaves.—Opposite or verticillate, more rarely alternate, simple, the shape varying, but always entire and destitute of stipules, although sometimes a swelling—a pseudo-stipule—appears extending transversely between two opposite leaves, as in certain Echites, or various appendages (glands, scales, etc.) may remind us by their presence of stipules.

Flowers.—In cymes, rarely in racemes, sometimes solitary; regular, hermaphrodite, pentamerous. *Calyx*, of five sepals, bearing often on the interior, glands or scales quite analagous to those of the leaves. *Corolla*, regular, gamopetalous, with five lobes, æstivation twisted to the left or to the right. The corolla prolongs itself occasionally in long appendages, and bears frequently the *ligules* that are united thereto; these together constitute the crown, and which Duval studied under the name, not now used, *Lepals*. This exists more or less in size in a number of the Apocynaceæ. The odor is fragrant and strong, especially in the pure white flowers. Elsewhere, they are the same as the Asclepiadaceæ, Jasmineæ, Loganiaceæ, Rubiaceæ, and in general with the Contortæ of Linné.

Andrœcium.—Always five stamens, alternate with the petals, and with the filaments separating from the corolla at various heights. *Anthers*, bilocular, introrse, with dehiscence longitudinal, sometimes adhering to the stigma; the *connective* very often enlarged, possibly prolonging itself into filaments more or less long. *Pollen* granular,

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National de la Sociétié de Pharmacie de France, Membre Correspondant du Philadelphia College of Pharmacy, Officier D'Académie, etc." Montpellier, 1894. Instead of the usual short review under the Bibliographical Notices, it has been deemed advisable to place before the American readers a translation of the more important points of this commendable work, and it is hoped that this will serve to extend its usefulness. G. M. B.

with separate grains; it is this that distinguishes the Apocynaceæ and the Asclepiadeæ.

Disk.—Between the two interior cycles we find frequently a nectar-bearing disk, circular or five-lobed, or two large glands, or again a number of glandules. These organs are frequently aborted.

Gynœcium.—Always of two free *carpels*, rarely a little sunken, the receptacle developing slightly concave, and the insertion a small perigynium. The carpels sometimes distinct, at other times coherent on an ovary bilocular, or more rarely unilocular with parietal placentation. The distinct carpels often remain consolidated at the extremity with the base of the persistent style. The *styles* are at first free, then always united in a single one, frequently dilated at the disk, below the stigma, often bifid. The characters of the stigma are often important for distinguishing neighboring families. *Ovules*, ordinarily numerous, rather rarely two or one; semi-anatropous, anatropous or campylotropous.

Fruit, very various in shape and structure, and permits the division of the family into tribes; double follicle, capsule, berry, drupe, one or two locular. *Seeds*, ordinarily compressed, always of a certain shape, sometimes peltate, alated, or provided at one or both extremities with a tuft of hairs, or the awn sometimes greatly developed. *Albumen*, generally thin, existing nearly everywhere; cartilaginous or fleshy. *Embryo*, straight, with the radicle variously directed, with two cotyledons plane or folded or rolled up, often oily.

ANATOMY.—*Laticiferous vessels.*—It is often in the liquid which they contain that the active principle of the plant is found, and the species in which the latex does not gush forth in abundance with the least wound is here an exception. They are formed primitively by a small number of isolated cells, elongating themselves at the same time that the appendices of the plant, multiplying by innumerable ramifications, but these are not partitioned and do not anastomose. These are the *inarticulate laticiferous* vessels of Hartig. These appear already in the embryo. Chauveaud has shown the existence of these initial cells (4 rarely 8 or more) constant in number for each species, and placed in the tissue external to the central cylinder of the young embryo, in the pericycle. Once developed, the laticiferous vessels present quite a diversity in the organs, in certain species being infinitely richer than in others. Although their existence in the pericycle is quite constant, they

may be aborted in this or other regions. Sometimes larger than the neighboring cells, consequently easily seen and ordinarily on section ovoid or a little sinuous, at other times they are difficult to see because of their complete resemblance with the neighboring cells from which one may distinguish them in longitudinal section. The *walls* of these show a thin membrane like the neighboring parenchyma cells, the others a white membrane much more thick. The contents of these is sometimes granular and opaque, at other times transparent, or oleo-resinous and the consistence very thick, rich in caoutchouc. In the free state the aspect of the liquid is a white latex, rarely nearly clear. The wall is formed of pure cellulose, resisting the Amylobacter; this permits the separation of these vessels by maceration.

Internal Liber.—The ligneous fascicles are comprised between two liber zones, as in a great number of families. But here, contrary, to that which we find in the Cucubitaceæ, for example, the internal liber appears independent. It shows itself in the medullary region in scattered bundles, sometimes quite remote from the wood, while the external liber is immediately opposite to it. There is a great abundance in nearly all the tissues of calcium oxalate in two forms: rhombohedrons and macles,[1] sometimes in mass, at other times separate, and their localization is frequent along the sclerotic or fibrous elements.

AFFINITIES.—The single character, that is always constant in the Asclepiadaceæ, the cohesion of the pollen grains, serves to distinguish it from the Apocynaceæ. The latter likewise in certain characters approaches the Loganiaceæ, Rubiaceæ, Oleaceæ and even the Gentianaceæ.

HISTORY.—The European Apocynaceæ, Nerium and Vinca, are native and known in the most ancient times. Hasselquist supposes even that it was the Rose-Laurel, to which allusion is made in the first psalm of David. Dioscorides was acquainted with the Penenches and the Nerium, which Apuleius described under the name of Rose-Laurel. *In Arabia*, Avicenna distinguished two varieties, of which the one (woody and spiny), may be, according to Sprengel, was the

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[1] Macles, according to Stormouth, "a term applied to 'twin-crystals,' which are united by simple contact of their faces by interpenetration, or by incorporation, these twin forms being often repeated so as to form groups."

G. M. B.

Nerium salicinum Forsk, of Arabia. If we add that Avicenna wrote of a "tree of India poisonous and latex bearing, of which the thickened juice seems like Turbith," and in which we may possibly recognize (?) the Cerbera Manghas, we have nearly all the knowledge that the ancients possessed upon the Apocynaceæ.

The first American Apocynaceæ described appears to be the Thevetia Ahouai, of which Thevet wrote in 1558. In India, GARCIA AB. HORTO pointed out Ophioxylon serpentium and the Carissa Carandas; D'ACOSTA the Cerbera Manghas, and, in Europe, Lobel described the Apocynum Venetium. Toward the close of the seventeenth century Rheede and Rumphius make known the numerous Apocynaceæ of India, while Plukenet, Plumier, etc., multiply the number of American species. During the whole of the last century the voyages of the naturalists accumulated the materials that Linné and his successors arranged. Already, Adanson, then A. L. De Jussieu, had reunited in one natural group the Apocynaceæ and the Asclepidaceæ. Finally, Robert Brown, at the commencement of this century, gave to the Apocynaceæ the limits generally accepted to this day. It is remarkable that the history of those which are of medical interest is entirely recent.

GEOGRAPHIC DISTRIBUTION.—Nearly all the Apocynaceæ are intertropical, and for the most part in the hottest regions; and beyond the tropics they diminish abruptly and are represented by only a few species: India, Malaysia, tropical America, the Antilles, Equatorial Africa, Madagascar, the Mascarene Islands, all offer numerous species. Australia and Oceanica contain less. M. F. von Mueller enumerates fifty in Australia. In Europe, in Asia (except the regions indicated), and in North America, are very few. The area of distribution is very variable for the same species; many species are localized in one point of the globe; many others, all neighbors, are common to all the tropical regions.

USES AND PROPERTIES.—In certain Apocynaceæ, the magnificent flowers are used in perfumery, especially in India. The hot-houses of Europe contain quite a number, remarkable for the beauty of their flowers or of their foliage. But the point of greatest interest here is the study of the medical properties of the group. A singular contrast is offered by the presence of inoffensive vegetables or comestibles in the midst of terrible poisons. Certain fruits of the Apocynaceæ often may be eaten with impunity, and the latex, ordinarily

so very rich in toxic substances, may, in some species, become a real food. Other plants assume the properties of simple bitters, astringents or febrifuges, while the latex of others is a powerful purgative. It is not the less certain that the general properties of the Apocynaceæ are a remarkable homogeneity, and that the immense majority of the species are suspected plants. Wherefore, it is even supposed these poisons are as terrible as the Strychnos, their neighbors. In these the action is purely irritant, corrosive, drastic, or emeto-cathartic; in others, exist principles, sometimes isolated already, more frequently yet unknown, and which act energetically upon the heart or upon the nerve system. Many of this class are glucosides and joined more or less with the group Digitalines. Their localization is various; sometimes in the whole plant, at other times in the seed, the pericarp, the bark, the wood, etc. It happens even, rarely it is true, that the latex and the fruit, for example, have properties entirely different.

FRUITS AND SEEDS.

Those treated are here classified as follows:

(1) The fruits with a dry pericarp (Strophanthus, Holarrhena, Wrightia). It is here the seeds that we employ in medicine.

(2) The fruits with a fleshy pericarp. The poisonous ones (Tanghina, Cerbera, etc.), the more frequently, especially in their kernel. The others, to the contrary, are aliments (divers, Carissa, Melodinus, etc.), nearly always in the pericarp.

FRUITS WITH A DRY PERICARP.—We distinguish in these fruits: the group Strophanthus, of which the medicinal species are African; and those of the Holarrhena and Wrightia employed almost only in India.

THE STROPHANTHUS.

From the Greek *strophos* cord, *anthos* a flower. The enrolled aspect of the lobes of the corolla, which in certain species are twisted before the florescence like a bit of cord with five elements, is the character upon which the name of the genus was founded by A. P. DeCaudolle, in 1802. The genus then contained but four species. In the recent monograph on this genus by M. Franchet, 1894, he describes thirty-five species, and lays aside as insufficiently known botanically Strophanthus minor and S. asper, but these are important in materia medica. The memoirs of Alph. DeCandolle

(1844) described eleven species; Reber (1887) 18; Pax (1892), 25; Holmes (1892), 28. It must be admitted that their number is not definitely fixed.

(To be continued.)

CACAO STARCH.

Editor of the AMERICAN JOURNAL OF PHARMACY:

DEAR SIR:—Anent the article on cacao starch, by Professor Bastin, you expressed the hope that a method of distinguishing (or rather, recognizing) the addition of other starches, respectively, flours, would soon be discovered.

Allow me to point out that the relative size of the starch granules should form a good distinguishing mark, none of the commercially available starches being as diminutive as those of cacao.

Marmé gives the size as 0·005 millimeter, while rice and corn starch have 0·005 to 0·008 and 0·015 to 0·03 millimeter, respectively. From the size, rice starch might be mistaken for cacao starch, but rice starch is always angular, cacao starch never (or merely here and there).

In order to make an adulteration with any kind of starch or flour pay, the addition cannot well be less than 20 to 25 per cent.; besides, the adulterant has to be cheap, which would exclude sundry starches.

Yours respectfully,

HANS M. WILDER.

STERILIZATION OF THE SOLUTION OF MORPHINE CHLORIDE.

A. Berlioz (*Jour. de Pharm. et de Chim.* [5] **29**, 410), has found unaccountably sudden changes in his solution of morphine chloride during sterilization. After a number of experiments and observations, he has determined that the alkali of the glass is often the cause of the difficulty. He believes to be successful one should use a glass which yields the least trace of alkali, and also a temperature not quite 110° should be employed. As soon as this temperature is reached the darkening takes place very rapidly. When the alteration commences to take place in the cold, and the glass is not alkaline, then the difficuly probably lies in the impurity of the morphine salt.

EDITORIAL.

The paper in this issue on the "Structure of Podophyllum," is intended to be the first of a series of illustrated articles by Professor Bastin on our indigenous drugs. We hope to have one of these contributions every month, but that cannot be definitely promised, since the very nature of the work precludes absolute regularity.

While illustrations of foreign drugs are to be found in every text-book on the subject, the medicinal plants of our own country have not been so exhaustively treated.

We trust that these illustrations and descriptions will be appreciated by students and others in this country, as we are sure they will be by our foreign readers.

With an abundance of raw material at his disposal, and with the unusual facilities which he possesses, we feel that no one is better adapted to take up this long-neglected subject than Professor Bastin; and we anticipate that he will give us a vegetable histology of our own country, which will not only be of present interest, but will at the same time be of permanent value.

THE BRITISH PHARMACEUTICAL CONFERENCE.

The recent Conference at Oxford, England, appears to have been one of unusual interest.

The president, N. H. Martin, severely criticized the pharmacists for giving too much weight to the business side of their profession, and little or no consideration to those scientific matters which go to make their calling a profession. "Pharmacy," he declared, "as a trade is a failure."

As a remedy he advocated more severe preliminary examination of apprentices, followed by a longer course of study than is now required.

Leaving the pharmacist, he vigorously denounced the medical profession for listening to the advice of the enterprising manufacturers, who impose on the gullible physician such imaginary preparations as "skinnaline, containing the active principles of the skin," and "liq. curaline co.," which will cure all ailments, etc.

Many of the papers presented were of a high order of merit; almost all of them bore evidence of original research on subjects of a chemical or pharmaceutical nature. There was a marked absence of that class of papers frequently presented in the American Association, which are often merely rambling theories about the profession of pharmacy, pharmacy laws, boards of pharmacy, pharmaceutical education, etc.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Companion to the latest edition of the British Pharmacopœia.—Comparing the strength of its various preparations with those of the United States and other foreign Pharmacopœias, to which are added not official preparations, and practical hints on prescribing.

By Peter Squire. Sixteenth edition. Revised by Peter Wyatt Squire and Alfred Herbert Squire. London: J. and A. Churchill, 1894. Pp. 693.

Since the publication of the fifteenth edition in 1890, the authors, with a

staff of experimenters, have devoted their time to the collection of information from various sources and to experimental work. Comparative experiments have also been made with pill excipients.

The comparisons with foreign Pharmacopœias have been revised with the following new editions: Danish, 1893; German, 1890; Russian, 1891; Swiss, 1893; United States, 1893. The new Italian Pharmacopœia has also been added to the list, which now numbers fifteen. The subject-matter has been enlarged by 120 pages; these additions are pretty evenly distributed through the book.

That portion relating to excipients for pills will bear repetition as follows: "Excipients for pills are of two kinds: (1) Those which are more or less fluid and employed to bind together powders, or to impart the necessary moisture to adhesive substances; (2) those, generally in powder, which are intended to absorb moisture and give solidity to the mass. Of the former, 'Dispensing Syrup' (equal volumes of glycerin, syrup and mucilage) and glucose are most in request; proof spirit also is very useful. Glycerin by itself is distinctly inferior to the foregoing. Glycerin of tragacanth is much employed, but in the majority of cases where it would be used, we prefer glucose, either by itself or mixed with an equal weight of syrup.

"Of the powders, that of liquorice root is most useful when moisture is to be absorbed and no binding power required. An unexpected exception is the case of carbolic acid, which makes a very good plastic mass with twice its weight of liquorice powder (when well worked together, the result is very satisfactory).

"When more plasticity is required, the absorbent powder is supplemented with compound tragacanth powder, or powdered gum acacia. For essential oils this condition is best obtained by the use of powdered curd soap; as a rule, one minim of the oil will require half a grain of the soap and two grains of the liquorice.

"A mixture of paraffins (massa paraffinum), without or with kaolin (massa kaolin), is used for substances which are readily reduced by organic matter, such as the permanganates and the salts of gold and silver.

"It 'goes without saying' that an excipient must not be chemically incompatible with the other ingredients, but there is not much opportunity for such an occurrence with those above selected."

We further learn that in making *Liquor Plumbi Subacetatis*, "digestion in the cold for a week answers equally well, if not better, than the half hour's boiling."

The book is interesting, not only to those working with the British Pharmacopœia, but almost equally to those using any Pharmacopœia; for instance, under opium we are able to read at a glance the morphine requirements of fifteen Pharmacopœias, besides that of Great Britain.

Coming as it does during the revision of the British Pharmacopœia, it will be of great value to those engaged on this latter work.

Produits fournis a la matière médicale par la famille des Apocynées. Par Louis Planchon. Montpellier. 1894. Pp. 364.

This interesting and valuable monograph is reviewed more in detail on page 449.

Lessons in Qualitative and Volumetric Chemical Analysis. By Dr. Charles O. Curtman. Including Lessons in Qualitative Chemical Analysis, by Dr. F. Beilstein. Fourth edition. St. Louis, Mo. John L. Boland Book and Stationery Company. 1894. Pp. 295.

The first edition of this work was a small volume of 154 pages, issued as "Beilstein's Chemical Analysis," and was to a great extent a translation. The author has since made a great stride in adapting the book to the uses of the American student and pharmacist. As now perfected it is a complete work on qualitative and volumetric analysis. While the qualitative portion is in part a translation, the volumetric part bears evidence of being the fruit of the author's own ripe experience.

Among the notable features of this edition are: a section on the examination of drinking water, which has been recast from the previous edition so as to embody the recent advances made in this important field of hygienic investigation; a section on urine analysis, which has been largely rewritten, and copious additions to the section on volumetric analysis, so that it now forms a complete commentary on the volumetric assays of the last revision of the U. S. Pharmacopœia.

The author has adopted the orthography to conform to the rules of the chemical section of the American Association for the Advancement of Science. While we are not prepared to condemn this method of spelling chemical terms, we are inclined to the belief that the authors of pharmaceutical text-books should make them conform to the Pharmacopœia.

Proceedings of the Connecticut Pharmaceutical Association, at the eighteenth annual meeting, held at Hartford, Conn., February 6 and 7, 1894.

The feature of this number is the "Report on Progress of Pharmacy," by A. Felton Wood. The secretary is Frederic Wilcox, Waterbury, Conn.

The Medicinal Plants of Tennessee.—Arranged and published under the direction of T. F. P. Allison, Commissioner of Agriculture, by A. Gattinger, M.D., Nashville, Tenn. 1894. Pp. 128. The commercial values of the plants receive considerable attention, and the part of each plant employed is stated, as well as the best time of year for collection. A tabular statement is made of the prices paid to collectors, which cannot but be of value to those contemplating a trial at this business.

The author, in his preface, gives a few instances of practical field work of the character this book is intended to introduce and encourage, among them being the following: Three miles from the eastern limits of the city of Nashville grows abundantly Sweet Cicily (*Osmorrhiza longistylis*), in moist copses and shady groves. The root, which may be quickly lifted from the loose leaf-mould in which it luxuriates, is quoted at 18 cents a pound, twenty-five or thirty roots making a pound, and several hundred roots could be collected in a few hours. To the right and left of the Lebanon Pike stands any number of a two-foot high, homely weed, White Vervain (*Verbena urticæfolia*). The root of this plant brings 8 cents per pound. It can be pulled out of the ground by taking hold of the stem. Wintergreen (*Gaultheria procumbens*) often covers whole mountain sides in a dense sward. It may be cut with a scythe, dries easily, weighs rather heavily, and sells for 4½ cents a pound. It pays well for the labor of cutting and baling it. On the summits of the Bald and Smoky

Mountains, in East Tennessee, the tiny Goldenthread (*Coptis trifolia*) covers the ground, often imbedded in the moss, whence it can be gathered with the fingers. The whole plant, root and top, is quoted at 25 cents per pound, and the supply is unlimited. The Hop-tree (*Ptelea trifoliata*), and the Canadian sumach (*Rhus Canadensis*), abound in the glades of Middle and West Tennessee; they are shunned by cattle and sheep, and serve only the purpose of shading the ground. The bark of the root of the former brings 15 cents, and of the latter 9 cents per pound.

This book will be furnished free to citizens of the State who desire to make practical use of the information it contains, but has not been published for indiscriminate distribution. Persons living outside of the State can obtain copies in paper binding at 50 cents, and in cloth binding at 75 cents, by addressing Franc. M. Paul, 309 North Market Street, Nashville, Tenn.

One Hundred Years of Business Life. 1798-1894. W. H. Schieffelin & Co. New York.

A very neat, attractive and, what is more, interesting souvenir, has been issued by the above firm. Its scope cannot be better explained than by quoting the "Prefatory Note:" "The year 1894 completes a century of existence for the house of W. H. Schieffelin & Co. They are naturally induced to emphasize the fact, and therefore have determined to make it the occasion of offering to their friends a greeting in the form of a pamphlet, which is intended to set forth the historical as well as commercial significance of this exceptional circumstance.

"Six changes in the composition and name of the firm occur, which suggest convenient periods into which to divide the following story of American business life."

"Lawrence & Schieffelin, 1794-1799.
"Jacob Schieffelin, 1799-1805.
"Jacob Schieffelin & Son, 1805-1814.
"H. H. Schieffelin & Co., 1814-1849.
"Schieffelin Brothers & Co., 1849-1865.
"W. H. Schieffelin & Co., 1865-1894."

The history of the United States, readily interwoven with that of the firm and interspersed with numerous well-executed illustrations, occupies fifty pages of the pamphlet. The remaining six pages, as an appendix, are devoted to a concise history of "One Hundred Years of Chemistry and Pharmacy." It is not sufficient to say that this is a creditable publication; we must rather say that it should have a permanent place among the historical records of our country.

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

THE BRITISH PHARMACEUTICAL CONFERENCE.

The opening exercises of the Conference took place at Oxford, England, July 31, 1894. We are indebted for the following information concerning the proceedings, to the *Pharmaceutical Journal and Transactions*, and the *Chemist and Druggist;* the editor of the former kindly supplied us with the advance proof sheets of the president's address.

The Conference was welcomed by Dr. Caird, Master of Balliol College, Walter Gray, Esq., Mayor of Oxford, and Sir Henry Ackland, Bart., K.C.B. (Regius Professor of Medicine of the University of Oxford). The last speaker considered that the whole question of medical science, and along with it the question of scientific pharmacy, was undergoing a change as well as a course of progress and enlargement which the world had never seen before. It depended upon various causes—it depended upon the progress of biology, on the broad views taken of the whole nature of life on our planet, and especially upon the fact that attention was being given throughout the whole world, not really so much to the treatment of disease as to the prevention of it.

The President, Mr. N. H. Martin, selected "Medicine and Pharmacy" as the subject of his address. This he considered sufficiently broad to allow him to speak as candidly of British pharmacists and pharmacy as he did some months ago, in another place, of their American congeners.

In answer to the question whether the condition of pharmacy in its own special domain is satisfactory at the present time, he was compelled to speak in the negative; but, he argued, this is in a very great measure due to certain peculiar directions in which the trade in medicines has developed in recent years, and the Pharmaceutical Society is most certainly in no degree to blame for the present condition of affairs. It is rather registered chemists and druggists who are to blame, for endorsing the falsehoods of advertising quacks and helping to create on the part of the public an unhealthy demand for proprietary medicines. The manner in which medical practitioners are inveigled into recommending and prescribing quack remedies was also forcibly declaimed against.

It is impossible, it was pointed out, in the practice of pharmacy, to grasp commercial advantages and yet retain the rewards properly belonging to professional services, and pharmacy must shortly make its choice between the two. The very essence of trade is that it is capable of indefinite expansion, and there is no limit to which a tradesman may sell his goods through the agency of others. But indefinite expansion is impossible in the fulfilment of the proper functions of pharmacy, which stamp it as a profession rather than a trade, requiring the members to receive a special education and give evidence before a legally constituted body that they have been so educated. The service rendered also is personal and direct.

Pharmacy as a trade is a failure, and rightly so, as nothing can justify the use of professional knowledge to excite men's fears and play upon human credulity for gain.

Regarding the steps which should be taken to enable pharmacy to realize its privilege and accept its responsibilities as a profession, it was recommended that the entrance examination should be made a more stringent test of intellectual powers and school training. Algebra, geometry, history, geography, and a modern language should be included in the syllabus, and an extended knowledge of Latin should be required. This entrance examination should not be passed before the age of seventeen, and should be followed by a three years' actual apprenticeship. An enforced curriculum covering two years should then precede the qualifying examination, lasting a week or more, and success in this should carry with it the qualification and title of pharmacist.

The president's address having been concluded, he received a unanimous vote of thanks.

Reports of the secretary and treasurer followed, and then the report of the Formulary Committee was read. Four new formulas have been added to the new edition just published, viz.: "Collodium Stypticum," "Extractum Belladonnæ Folii Alcoholicum," "Liquor Bromo-chloral Compositus," and "Syrupus Acidi Hydriodici." Other alterations consist chiefly in lessening the acidity of certain syrups, and in an improved formula for "Collodium Belladonnæ," which is now directed to be made from a solid alcoholic extract of belladonna leaf, assayed at the time it is used so as to obtain a uniform product, instead of from a liquid extract.

The following papers were then read:

Note on the Stability of the Alkaloidal Tinctures. By E. H. Farr and R. Wright.

The authors examined a number of tinctures which had been kept for twelve months to three years, and their conclusions were that no appreciable change in the alkaloidal value of tinctures takes place on standing; unimportant exceptions occurred with the tinctures of veratrum and cinchona, but the average loss in the most extreme case did not exceed 5 per cent.

The same authors presented another paper on the *Gravimetric and Volumetric Methods for the Determination of the Alkaloids in Alkaloidal Tinctures,* in which they reverted to the paper of Caspari and Dohme, read before the American Pharmaceutical Association last year, who advocated volumetric methods. The present authors, however, showed that with aconite and colchicum the volumetric methods are absolutely worthless, while they are unsatisfactory with cinchona and veratrum. In conclusion, it was maintained that the results yielded by gravimetric methods are, if anything, the more reliable of the two.

The Qualities of a Typical Dentifrice was the subject of a paper, by Arthur Turner. As a mechanical base chalk, "prepared" rather than "precipitated," is preferable to pumice; the latter may scratch and injure the enamel. No base should be used that will scratch silver. Charcoal and astringents are objectionable for various reasons. A little sodium bicarbonate should be added, and the flavoring should be oil of cinnamon, which also possesses valuable antiseptic properties.

A New and More Economical Process for Extractum Nucis Vomicæ was offered by E. W. Lucas, who recommended a dry extract instead of the present liquid one of the Br. P.

Note on Strychnos Ignatia, by F. Ransom. *Remarks on Gnetum,* by W. Elborne. *The Recovery of Residual Tinctures from Marcs,* and the Pharmacopœial instructions for the *Preparation of Tinctures,* by R. H. Parker, concluded the proceedings of the first day.

On the second day, Wednesday, August 1st, F. C. J. Bird led by reading "Some Laboratory Notes."

In addition to several practical suggestions, he favored the more extended adoption by the Br. P. of the process of repercolation, especially in the preparation of resin of podophyllum.

Note on Extract of Malt with Cod Liver Oil, and *The Keeping Qualities of Certain Samples of Spirit of Nitrous Ether*, were two papers by Henry William Jones.

With a view to rendering the natural features of the district more intelligible to visitors, G. C. Druce next gave some brief descriptive *Notes on the Geology, Botany and River Systems of Oxford and its Neighborhood.* An instructive paper was then read on *Animal Extracts*, by C. E. Stuart. *An Examination of Leonurus Cardiaca*, was the subject of a paper by W. A. H. Naylor. The drug for this analysis was grown and supplied by E. M. Holmes, who at the same time supplied some interesting information concerning it.

S. Rideal contributed a paper on *The Conditions of Papain Digestion.* Compared with pepsin under identical conditions, papain seemed to give the better results with meat fibrin, but with regard to egg albumen its digestive power appeared intermediate between that of two pepsins examined.

C. J. S. Thompson recommended the use of *Cocoanut Stearin as a Basis for Suppositories.* When mixed with white wax in the proportion of four ounces of the stearin to 340 grains of the wax, the author had found that it furnished a mass melting at 98° F., and becoming solid at 64° F. Its advantages over theobroma butter appear to be in its keeping qualities, and in its solidifying more rapidly.

R. H. Parker read a *Note on Phosphorus Pills.* The quantity of phosphorus necessary for 24 pills is dissolved in 30 minims of carbon disulphide, and the solution poured on 24 grains of liquorice powder in a mortar, and stirred with a spatula until the solvent is nearly dissipated, when sufficient syrup, glycerin and tragacanth powder are added to form a pill mass. *The Nomenclature of Official Remedies* was the subject of a paper by Joseph Ince.

Richard Usher read a paper on *English Medicinal Rhubarb and Henbane*, in which the methods of cultivating these drugs in England were discussed and explained. *Tinctura Ergotæ Ammoniata* was treated in a paper by J. T. Hornblower. A communication on *Rhubarb* was presented by Barnard S. Proctor. He had been investigating this drug at intervals since 1868. The odorous principle of the root he found was capable of being extracted by percolation with chloroform, without detracting from the medicinal value of the powder; but it was found that the deodorized powder acquired smell again, apparently by the action of air and moisture. When chrysophanic acid has been removed from the powder by percolation with benzol, a further development of the acid takes place on submitting the exhausted powder to the action of air, water and potassium hydrate.

The Adaptation of the Soap Basis of Linimentum Potassii Iodidi cum Sapone to some other Br. P. Liniments, was suggested in a communication by E. W. Lucas. J. F. Liverseege presented papers on *Tincture of Iodine and its Analysis*, and *The Calibration of Pipettes.*

Some Fallacies in the Testing of Essence of Lemon were explained by Arthur A. Barrett, of Messina. Finally a paper was presented from David Hooper on *Extract of Indian Hemp.* The author gave a brief review of the history of the plant, and called attention particularly to the extract as containing the active principle of the drug.

Following this, he described the best method of preparing the extract, gave some interesting facts concerning the composition of the extract, and added some results obtained by an examination of commercial extracts.

President N. H. Martin was elected to serve another year, and the Conference decided to hold the meeting of 1895 at Bournemouth.

PENNSYLVANIA PHARMACEUTICAL EXAMINING BOARD.

At the recent meeting of the State Pharmaceutical Examining Board, held at Williamsport, Pa., July 14th, 78 persons appeared for examination as Registered Pharmacists, and 29 as Qualified Assistants—a total of 107. Of this number, 17 passed successful examinations as Registered Pharmacists, and 14 as Qualified Assistants—a total of 31. The next meeting of the Board for the examination of applicants for registration will be held at Philadelphia and Pittsburg (date not yet determined). All applicants for examination should apply to the Secretary, Charles T. George, 1306 North Third Street, Harrisburg, Pa., not later than October 1st, for examination blanks, and exact time and place of next meeting.

OBITUARY.

C. R. Alder Wright, B. Sc., D. Sc., F. R. S., of London, England, died July 25, 1894. The *Chemical News*, of August 3d, contains the following information concerning the deceased:

"No English chemist has covered so much ground. His work began with a paper published in February, 1866, in the *Journal of the Chemical Society*, on the *Action of Light on Sensitive Photographic Papers*, when Wright was a student at Owens' College, Manchester. Leaving Owens' College, he entered the Weston Works of the Runcom Soap and Alkali Company, as chemist.

"In August, 1867, we find a valuable paper in the *Journal of the Chemical Society*, in which Dr. Wright describes his experiences in alkali works.

"His work comprises investigations of simple substances like hydriodic acid, and some of the most complex substances, like the vegeto-alkaloids, upon which he labored for many years—sometimes alone and sometimes in conjunction with Mathiesson and others.

"Alder Wright was a mathematician as well as a chemist, and we find nine papers *On the Determination of Chemical Affinity in Terms of Electromotive Force*. These papers alone occupy a thick volume. They appeared for the most part in the *Philosophical Magazine*.

"In the *Journal of the Chemical Society* for February, 1873, there is a paper *On the Hydrogen Occluded by Palladium*, by W. Chandler Roberts and C. R. A. Wright. A series of papers then follows on *Isomeric Terpenes, Essential Oils*, etc., in the same year.

"On Friday, March 13, 1874, Wright delivered an evening lecture at the Royal Institution *On the Chemical Changes Accompanying the Smelting of Iron in the Blast Furnace*, embodying extensive experience he had gained in the works and research laboratory of Sir Lowthian Bell.

"In the *Journal of the Chemical Society*, January, 1878, appeared his first paper, entitled *Researches on Some Points in Chemical Dynamics*. The fourth of these papers appeared in December, 1880.

"His voluminous and valuable work on 'Ternary Alloys' was communicated to the Royal Society during the years 1889 and 1892.

"During the last week or two, his health had been failing through an attack of diabetes mellitus, but no consequences of serious import were anticipated, until Monday, July 23d. On Wednesday morning he became comatose, and never recovered consciousness, death occurring early in the afternoon of that day."

In addition to the above, may be mentioned the recent volume of Dr. Wright on *Fats, Oils and Waxes*, which is a standard authority on these substances.

He was elected a corresponding member of the Philadelphia College of Pharmacy in March, 1893.

Dr. Clarence H. Risk, Ph.G., Class of 1876, died at the residence of his brother, Summit, N. J., July 3, 1894, of heart failure, aged 45 years, 5 months and 12 days. He was born at Lewisburg, Pa., January 21, 1849. He received his early education at Muncy and Carlisle, Pa., and attended a private school at Princeton, N. J., and from there he went to Lafayette College for two years, after which he learned the drug business with Risk and Mason, in Philadelphia, and graduated from the Philadelphia College of Pharmacy in 1876. After his graduation in pharmacy he attended the University of Pennsylvania and graduated as a physician from that institution in 1878. After his graduation in medicine he was in the drug business at Nineteenth and Berks Streets, and in 1879 removed to Baltimore, Md., and was in the drug business at Charles and Reed Streets, where he continued until 1885, when he sold out his business and travelled in South America and Europe, returning to this country in 1887, and entered the Bridgeport Hospital as resident physician for about one year. His health failing him, he gave up practice and he was not in active business at the time of his decease.

Felix Anthony Lyneman, Ph.G., Class of 1877, died suddenly in Denver, Col., June 19, 1894, from apoplexy. He had been in his usual good health, except complaining of a slight headache and pain in his left side, which caused neither him nor his family any alarm. Before dressing to go down-stairs to his breakfast, he entered the bath-room and was found shortly afterward by his wife, unconscious, and lived only a few hours afterward. He was thirty-seven years of age, and was a native of Richmond, Va., and was born of German Catholic parents. He learned the drug business and graduated from the Philadelphia College of Pharmacy in 1877. He was a member of the Alumni Association and of the American Pharmaceutical Association. He was also a member of the Colorado Pharmaceutical Association, and was its Secretary from its organization, having been re-elected twice to the office. At the time of his decease, he was the proprietor of two pharmacies in Denver, and was one of the most kind-hearted and genial of men, well liked by all who knew him, as was shown by his fellow-druggists, who attended the funeral in a body.

GERARD TROOST.